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Life Science Foundation

Date: 15th July 2022

Ignite Fast Grant Awards in Agriculture Science

OPEN CALL FOR PROPOSALS: submissions due by 20th August 2022

Background

Nitrogen is abundant in nature; it makes up about three-fourths of the atmospheric gases. Plants cannot use this gaseous form directly. Instead, atmospheric N has to be "fixed" into a form in the soil that can be taken up by plants. Furthermore, a significant proportion of naturally fixed N in the soil is produced by the action of microbes, both free-living and those associated with plants.

Nitrogenous fertilizers used in modern industrialized agriculture are manufactured using ammonia as a precursor and are a major factor driving increased agricultural productivity. Ammonia is made using the Haber – Bosch process which was discovered in 1909.

Synthetic nitrogenous fertilizers will continue to be needed in farm production systems. The processes used in their manufacture and their use pose several challenges. The critical question today is whether we can use science and technology to mitigate, if not eliminate, the challenges arising from the large-scale manufacture and use of synthetic nitrogenous fertilizers.

The Challenges:

1. Industrial-scale ammonia production and its subsequent conversion to synthetic N fertilizers is a high energy-consuming process. It also has a very high carbon footprint – the hydrogen gas used as feedstock is produced from petroleum gas, coal, or other oils, releasing considerable CO_2 and other greenhouse gases. **How can we produce N fertilizers in nature-friendly and sustainable ways to ensure future crop productivity increases?**
2. The easy availability of synthetic N fertilizers has often led to their excessive use at the expense of other organic sources. Organic manure, say farmyard manure, may not provide as much N per unit volume but adds the much-needed carbon essential for

maintaining microbial activity and sustaining soil health for plant growth. **Can novel biological sources be discovered or formulations be concocted in resource-efficient ways to address this problem of depletion of organic carbon and restore soil health?** These need not necessarily replace synthetic N fertilizers but must be compatible with them to be used in judicious combinations to reduce their overall use without compromising crop productivity.

3. Soluble forms of N used by plants are highly mobile in soil. Synthetic fertilizers applied to the soil tend to leach down beyond the root zones and often reach water bodies where they cause eutrophication. Furthermore, several species of microbes in the soil act as de-nitrifying agents that release the fixed N back to its gaseous form, reducing the availability for plants. **Can we develop novel methods to reduce loss and optimize N fertilizer usage?**
4. Plants belonging to the *Leguminosae* species have a symbiotic relationship with the N-fixing soil microbe, *Rhizobium spp.*, which are harboured in their root nodules from where they provide fixed N to the plant. Free-living microbes can also fix N and make it available to the crop plant. **Can we develop new microbial inoculants as nature-friendly supplements to address the soil nutrient depletion problem? Are there genetic engineering/genome editing methods to enhance plants to leverage N-fixing microbes?**
5. Crop plants show significant genetic diversity in their ability to assimilate available N or Nitrogen Use Efficiency (NUE). **What types of genetic engineering/genome editing in plants will improve their NUE, and how does one make it commercially viable?**

Call for Proposals

Research proposals addressing the Challenges listed above are invited from **not-for-profit research institutions (public or private)**. The Challenges listed above are to be interpreted in their broadest sense. Preference will be given to collaborative proposals involving groups with divergent expertise. **High-risk, high-reward, multi-disciplinary approaches, that can positively impact the current nitrogen-based fertilizer ecosystem are welcome.**

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We prefer proposals that address a central hypothesis/question relating to a Challenge. The hypothesis should be testable using a clearly defined experimental approach within the tenure of the Grant. Proposals will be evaluated for originality and potential for future applications in Agriculture. All research proposals should be compliant with the rules and guidelines applicable in India.

The size of the funding request should be less than **INR 25 Lakhs per year**. Projects with smaller funding requests and comparable impact are preferred since they will allow us to fund more investigators. The tenure should be maximum of **three years, renewable each year based on a review by the scientific advisory panel.**

The proposals should be emailed to swamis@ignitelsf.in with "AGRISCIENCE PROPOSAL SUBMISSION" appearing in the subject line. The last date for submitting the proposal is **20th August 2022**. The awards will be announced around **20 September 2022**.

Additional information on this announcement can be obtained at our website: *ignitelsf.in* under NEWS AND ANNOUNCEMENTS.

Successful proposals will be announced through our website and via our Twitter handle: @ignitelsf

PROPOSAL CONTENTS

1. Background (1 page) including previous work done in investigator laboratories pertinent to this proposal
2. The question(s) being asked/the hypothesis being tested (1 page)
3. Why is this important (1 page)
4. Experimental approach that will be used (1 page)
5. Possible research outcomes and next steps the outcomes will trigger (1 page)
6. Budget (equipment, people, institution overheads, and consumables) and timelines for experimental plan (1 page)
7. Investigator(s) affiliations and contact details (1 Page)
8. Citations (1 Page) – in support of hypothesis and experimental approach
9. Brief investigator CV and List of FIVE recent publications (2 pages)